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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT F. ENENKEL and SIGITAS KERAS

Appeal 2008-2239
Application 10/008,473
Technology Center 2100

Decided:[1] April 6, 2009

Before JAMES D. THOMAS, HOWARD B. BLANKENSHIP, and THU A. DANG, *Administrative Patent Judges.*

BLANKENSHIP, *Administrative Patent Judge.*

DECISION ON APPEAL

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

STATEMENT OF THE CASE

This is an appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-19 and 23-44, which are all of the claims pending in this application. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm the Examiner's rejections of claim 1-19 and 23-44 under 35 U.S.C. § 101. We do not reach the Examiner's rejection of the claims under 35 U.S.C. § 103.

Invention

Appellants' invention relates to a method and apparatus for computing values of mathematical expressions (Spec. 1: 4-7). The method and apparatus computes a value of a polynomial by presenting input data that includes coefficients of polynomial p(x), x, a predetermined x_1, and $p(x_1)$. The input data are used to build polynomial c(x) having coefficients so that polynomial p(x) is expressible as $p(x_1) + \{x - x_1\} \cdot c(x)$. Each coefficient of polynomial c(x) is determined, and a value of polynomial c(x) is determined. A value of polynomial p(x) is determined. (Abstract.)

Representative Claims

1. A machine-processing method for computing a property of a mathematically modelled physical system, the steps comprising:

a) reading, via a machine processing unit, input data including a value for each identified ordered coefficient of a first polynomial p(x) representing said property, said polynomial p(x) being expressed as $p(x) = \Sigma(Pj \cdot x^j)$ where j=0 to n, a value of a quantity x, a value of a predetermined x_i, and a

value of a predetermined $p(x_i)$ correspondingly paired with said predetermined x_i;

b) building, via said machine processing unit, a value of a second polynomial $c(x)$ having ordered coefficients, said second polynomial $c(x)$ being expressible as: $c(x) = \Sigma(C_k \cdot x^k)$ where $k=0$ to $(n-1)$ so that said first polynomial $p(x)$ is expressible as: $p(x)=p(x_i)+\{x- x_i\} \cdot c(x)$, comprising the steps of:

i) determining, via said machine processing unit, a value for each ordered coefficient of said second polynomial $c(x)$ by generating a plurality of machine processing unit signals to determine each said ordered coefficient of said second polynomial $c(x)$ from: $C_k = \Sigma(P_{(k+1+j)} \cdot x^j_i)$ where $j=0$ to $(n-1-k)$;

ii) determining, via said machine processing unit, a value of said second polynomial $c(x)$ by generating a plurality of machine processing unit signals to determine: $c(x) = \Sigma(C_k \cdot x^k)$ where $k=0$ to $(n-1)$;

c) constructing, via said machine processing unit, a value of said first polynomial $p(x)$ by generating a plurality of machine processing unit signals to determine: $p(x)=p(x_i)+\{x-x_i\} \cdot c(x)$; and

d) outputting, via said machine-processing unit, said value of the first polynomial $p(x)$ representing said property of the mathematically modelled physical system, wherein

said value of the first polynomial is outputted as a floating point number and the floating point number is a digital representation of an arbitrary real number in said machine processing unit.

23. A machine for computing a property of a mathematically modelled physical system, the machine configured to perform the steps comprising:

a) reading, via a machine processing unit, input data including a value for each identified ordered coefficient of a first polynomial p(x) representing said property, said polynomial p(x) being expressed as $p(x) = \Sigma(P_j \cdot x^j)$ where $j = 0$ to n, a value of a quantity x, a value of a predetermined x_i, and a value of a predetermined $p(x_i)$ correspondingly paired with said predetermined x_i;

b) building, via said machine processing unit, a value of a second polynomial c(x) having ordered coefficients, said second polynomial c(x) being expressible as: $c(x) = \Sigma(C_k \cdot x^k)$ where $k = 0$ to $(n-1)$ so that said first polynomial p(x) is expressible as: $p(x) = p(x_i)+\{x-x_i\} \cdot c(x)$, comprising the steps of:

i) determining, via said machine processing unit, a value for each ordered coefficient of said second polynomial c(x) by generating a plurality of machine processing unit signals to determine each said ordered coefficient of said second polynomial c(x) from: $C_k = \Sigma(P_{(k+1+j)}\, x^j_i)$ where $j= 0$ to $(n-1-k)$;

ii) determining, via said machine processing unit, a value of said second polynomial c(x) by generating a plurality of machine processing unit signals to determine: $c(x) = \Sigma(C_k \cdot x^k)$ where $k = 0$ to $(n-1)$;

c) constructing, via said machine processing unit, a value of said first polynomial p(x) by generating a plurality of machine processing unit signals to determine: $p(x)=p(x_i)+\{x- x_i\} \cdot c(x)$; and

d) outputting, via said machine-processing unit, said value of the first polynomial p(x) representing said property of the mathematically modelled physical system, wherein

said value of the first polynomial is outputted as a floating point number and the floating point number is a digital representation of an arbitrary real number in said machine for computing.

Prior Art

The Examiner relies on the following references as evidence of unpatentability.

Ito	4,398,263	Aug. 9, 1983
Kametani	4,870,608	Sep. 26, 1989

Robert H. Bishop, *Modern Control Systems & Design Using Matlab & Simulink*, 9, 17-21 (Addison Wesley, 2nd ed. 1997) (hereinafter "Bishop").

W.J. Cody, *Performance Evaluation of Programs for the Error and Complementary Error Functions*, ACM Trans. Math. Softw., Vol. 16, No. 1, 29-37 (1990) (hereinafter "Cody").

Shmuel Gal, et al., *An Accurate Elementary Mathematical Library for the IEEE Floating Point Standard*, ACM Trans. Math. Softw., Vol. 17, No. 1, 26-45 (1991) (hereinafter "Gal").

Duane Hanselman, et al., *The Student Edition of Matlab, Version 5 User's Guide*, xvii-xviii, xix, 144, 149, 321, 315 (Prentice Hall 1997) (hereinafter "Hanselman").

Edward W. Ng, *A Comparison of Computational Methods and Algorithms for the Complex Gamma Function*, ACM Trans. Math. Softw., Vol. 1, No. 1, 56-70 (1975) (hereinafter "Ng").

Examiner's Rejections

Claims 1-19 and 23-44 stand rejected under 35 U.S.C. § 101.

Claims 1-4, 8-10, 23, 24, 26, 30-32, and 41-44 stand rejected under 35 U.S.C. § 103 based on Bishop and Kametani.

Claims 11 and 33 stand rejected under 35 U.S.C. § 103 based upon Bishop, Kametani, and Gal.

Claims 5-7 and 27-29 stand rejected under 35 U.S.C. § 103 based upon Bishop, Kametani, and Ito.

Claims 15-17 and 37-39 stand rejected under 35 U.S.C. § 103 based upon Bishop, Kametani, and Cody.

Claims 18 and 40 stand rejected under 35 U.S.C. § 103 based upon Bishop, Kametani, and Ng.

Claims 12-14 and 34-36 stand rejected under 35 U.S.C. § 103 based upon Bishop in view of Kametani and Hanselman.

Claim Groupings

Based on Appellants' arguments in the Appeal Brief in response to the § 101 rejection, we will decide the appeal on the basis of claims 1 and 23. *See* 37 C.F.R. § 41.37(c)(1)(vii).

ISSUE

Are claims 1 and 23 directed to patent eligible subject matter under 35 U.S.C. § 101?

FINDINGS OF FACT

Appellants' Admissions

1. The present invention is directed to solving a polynomial with greater precision than the inherent precision of the floating-point number system of the computing system (App. Br. 5).

2. As recognized by those skilled in the art, a floating point number is a digital representation of an arbitrary real number in a computer (*id.* at 9).

3. The invention's utility is improving the precision of a floating point number system in a computer (*id.*).

Appellants' Specification

4. The invention relates to a method and apparatus for computing a value of a mathematical expression, such as a polynomial or a rational function (Spec. 1:4-7).

5. All of Appellants' figures only show flow charts for computing a value of a mathematical expression such as a polynomial, a rational function, and a Bessel function, "in accordance with the present invention" (*See* Figs. 1-3; Spec. 11:8-14).

6. The method of computing a value is performed by a computer executing programming instructions (Spec. 12:2-9, 26:1-5).

7. The machine for computing a value is a computer (*id.*).

8. The Specification does not define a specific apparatus for a "machine processing unit." The Specification only states that the machine processing unit can be a central processing unit (CPU) (*id.* at 6:9-13).

9. The "input data" of the mathematical expression are values read by the CPU from a computer readable medium (*id.* at 6:9-13, 15:13 to 16:2).

10. The output of both the method and the machine is a numerical value (Abstract; Spec. 15:13-16, 21:13-16, 22:3-4).

ANALYSIS

"Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101. "[N]o patent is available for a discovery, however useful, novel, and nonobvious, unless it falls within one of the express categories of patentable subject matter of 35 U.S.C. § 101 . . . ." *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 483 (1974).

If claim 1 is directed to statutory subject matter, the claim falls within the statutory class of "process." A process is "an act, or a series of acts, performed upon the subject matter to be transformed and reduced to a different state or thing." *Cochrane v. Deener,* 94 U.S. 780, 788 (1877). "'Transformation and reduction of an article "to a different state or thing" is the clue to the patentability of a process claim that does not include particular machines.'" *Diamond v. Diehr*, 450 U.S. 175, 184 (1981) (quoting *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972)).

Our reviewing court recently held that the "useful, concrete and tangible result" inquiry, first set forth in *In re Alappat*, 33 F.3d 1526, 1544 (Fed. Cir. 1994) (en banc), is inadequate to determine whether a claim is patent-eligible under 35 U.S.C. § 101. *See In re Bilski*, 545 F.3d 943, 959-60 (Fed. Cir. 2008) (en banc). The Supreme Court's "machine-or-transformation test, properly applied, is the governing test for determining patent eligibility of a process under § 101." *Id.* at 956. "A claimed process is surely patent-eligible under § 101 if: (1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing." *Id.* at 954.

Appellants do not appear to argue that the method is tied to a particular machine or apparatus. Moreover, the mere recitation of a generic "machine processing unit" in the method does not tie the method to a "particular" machine or apparatus (FF 6-9).

Claim 1, however, also fails the second branch of the "machine-or-transformation" test. The claim does not contain or require an *article* that is transformed and reduced "to a different state or thing." *See Diamond v. Diehr*, 450 U.S. at 184. In *Bilski*, our reviewing court identified a circumstance in which *electronic* transformation of *data* into *a particular visual depiction of a physical object on a display* may be considered a transformation sufficient to render a claimed process patent-eligible. *See Bilski*, 545 F.3d at 962-63 (discussing *In re Abele*, 684 F.2d 902, 908-09 (CCPA 1982)). The calculation of a number (FF 1-5, 10) does not appear to be a type of "transformation" that is recognized by our reviewing court, or

by the U.S. Supreme Court, sufficient to render a claimed method patent-eligible.

In *Gottschalk v. Benson*, 409 U.S. 63 (1972), the claims were directed to a method for converting binary-coded-decimal (BCD) numerals into pure binary numerals for use with a general-purpose digital computer of any type. *Id.* at 64. The method steps in the body of the claim incorporated portions of a computer (a reentrant shift register) into the steps. The question before the Court was "whether the method described and claimed is a 'process' within the meaning of the Patent Act." *Id.* The Court characterized the claimed invention as "a generalized formulation for programs to solve mathematical problems of converting one form of numerical representation to another." *Id.* at 65.

The Court held that the claimed method was directed to non-statutory subject matter because "[t]he mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself." *Id.* at 71-72. Similar to the invention in *Benson*, instant claim 1 appears directed to a generalized formulation for a computer to calculate a number. The claim would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

The inquiry into whether a given claim would pre-empt all uses of a fundamental principle (i.e., law of nature, natural phenomenon, or abstract idea) is "hardly straightforward." *Bilski*, 545 F.3d at 954; *see also id.* at 952

n.5. However, the Supreme Court's "machine-or-transformation" test determines "whether a process claim is tailored narrowly enough to encompass only a particular application of a fundamental principle rather than to pre-empt the principle itself." *Id.* at 954. As claim 1 fails the "machine-or-transformation" test, the claim pre-empts a fundamental principle, rather than being limited to a particular application of the principle.

Appellants submit (App. Br. 9-10) that claim 23 is directed to patent eligible subject matter because the claim is directed to a "machine." That a claim may appear on its face to be directed to § 101 subject matter does not end the analysis. The ultimate question is whether the claimed subject matter falls within a judicially created exception to § 101. *See In re Alappat*, 33 F.3d at 1542. "*Benson* . . . applies equally whether an invention is claimed as an apparatus or process, because the form of the claim is often an exercise in drafting." *Id.* (quoting *In re Johnson*, 589 F.2d 1070, 1077 (CCPA 1978)).

We see no reason why placing what appears to be in substance the method of claim 1, which method preempts substantially all uses of a fundamental principle, under a preamble that purports "[a] machine . . . configured to perform the steps comprising" would render the claimed subject matter statutory. Considering the claim as a whole, we are not persuaded that claim 23 is directed to statutory subject matter.

Appellants also (App. Br. 10) refer to dicta in *In re Warmerdam,* 33 F.3d 1354, 1360 (Fed. Cir. 1994), and seem to conclude that a claim that is drafted to recite "a machine" is clearly patentable subject matter. However,

our reviewing court indicated that Warmerdam's claim 5, drawn to a "machine having a memory" containing a particular data structure generated by claimed method steps, was patentable subject matter. We do not read *Warmerdam* as standing for the proposition that drafting a claim as directed to a "machine" means that the subject matter automatically falls within the "machine," or any other, statutory class.

Appellants cite *In re Comiskey,* 499 F.3d 1365, 1379 (Fed. Cir. 2007), as standing for the proposition that claims that could require the use of a computer are directed to statutory subject matter under 35 U.S.C. § 101 (Rep. Br. 6-7). However, the Federal Circuit revised this opinion to clarify that as "to all of these claims, which under the broadest reasonable interpretation recite the use of a machine, we think that the § 101 question should be addressed in the first instance by the PTO." *In re Comiskey,* 554 F.3d 967, 981 (Fed. Cir. 2009). Therefore we do not read *Comiskey* as standing for the proposition that a claim that could require the use of a computer is automatically directed to statutory subject matter.

We have considered all of Appellants' arguments in defense of patent eligibility of claims 1 and 23, but are not persuaded that the claims are directed to statutory subject matter. We sustain the rejection of claims 1 and 23. Claims 2-19 and 24-44 fall with the base claims.

Section 103 rejection of claims directed to nonstatutory subject matter

We do not reach the rejections over prior art made by the Examiner -- the rejections based on the claims being unpatentable for prima facie obviousness -- because we conclude that the claims are "barred at the

threshold by §101." *In re Comiskey,* 554 F.3d at 973 (citing *Diamond v. Diehr*, 450 U.S. at 188).

CONCLUSIONS OF LAW

Claims 1-19 and 23-44 are not directed to patent eligible subject matter under 35 U.S.C. § 101.

DECISION

We affirm the Examiner's rejections of claims 1-19 and 23-44 under 35 U.S.C. § 101.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

msc

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